A Learning-Receptive State as Induced by an Auditory Signal or Frequency Pulse

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INTRODUCTION

Many instructional procedures and techniques are and have been developed to make learning more effective. From the introduction of the printed text teachers have expounded on techniques for getting the student or subject to more readily learn and recall the procedural transmission of text content and material. Holding the student's attention and perhaps arousing a little motivational commitment seem to still have a high degree of relevance and educational concern. After the printed text came the development of audio-visual techniques and programmed text content. Yet relatively few students appear to become so entranced with cognitive or non-cognitive skill learning that they will persist in spite of the lure of television and other recreational distractions.

It would seem that added emphasis on the intrinsic, self direction of students to find a learning state that is anticipating and basically stress free should succeed where the extrinsic, apparatus oriented approach has not. This is not to advocate that the many advantages of apparatus in teaching and education or training be discarded with the instructional materials so conscientiously developed. Rather that the student's perceptual awareness and dynamics for focusing attention be re-examined to deliberately establish what sort of intrapersonal responses to promising stimuli indicates a more persistent receptivity for learning and success in subsequent evaluation.

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[1]The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Army Research Institute or the Department of the Army.

By now the question must explicitly occur as to what methods and techniques are possible to bring about the self directed and intrinsic motivation of the learner as evaluated subject? In the context of my paper's direction, there is the accepted condition that attention is given to any stimulus that will achieve an independent identity whether pressure, light, sound or pain. Such a stimulus does not need to be at a conscious level of awareness, but can exist merely as an unheard sound or even suggestion. The necessary complement to the stimulus then is obtaining the student's or subject's awareness that the stimulus is present and can be responded to along with other intended behavior for an expected result.

Once this association is accepted, then a highly structured mode of instructional communication is required to relate to the stimulus which is unique and produces a facilitating response. Much as with the electrical pulses going through the telephone lines the voice message is accepted in the electrical current and reproduced for the listening party without any attending behavior toward the actual electrical pulse but only to the voice message. Accordingly, if a state is induced by an auditory signal using a pulsed sound frequency to ready the student and increase relaxation, an attentive rhythm will possibly occur to maintain a passively focused awareness. That is, once a characteristic alpha brain wave is induced by a particular set of auditory stimuli that condition should continue or be reinforced while positively suggested (voice) content material is presented in an initial or retrieved context.

METHOD

Now should the hypothetical state come about where a learner could respond to an auditory signal, it is conceivable that a more receptive behavioral mode would follow with less anxiety and a positive expectation for acquiring new information or recalling that already stored. There are contradictory experiences in the use of auditory signals and the method for inducing alpha brain waves. Research has shown some favorable experience for using alpha waves with a positively correlated relationship between percentage of alpha and memory (Green, 1973). This obviously sets the stage for exploring the use of the alpha wave state to figure out how learning may or may not attain specifically designated objectives with complementing positive reinforcement techniques for learning and retention.

At the edge of conscious attentiveness the alpha and theta brain waves may occasionally both appear. The more prevalent alpha frequency is functionally apparent even when the student's eyes are open, if properly conditioned. Usually with full physical reality contact, in an operational mode, the beta frequency is dominant. When the alpha wave is maintained from 8 to 13 Hz (cycles per second) and occasionally dropping below the 8 into theta, the student and trainee can experience a more complete sense of relaxation with attending auditory awareness.

In this state the individual is usually described as less ego involved and less inclined to have the usual susceptibility to inhibitions or so-called learning blocks. Within this state decision-making effectiveness will follow in a divergent pattern instead of converging in that many thoughts or images pass through the level of awareness with no conscious attempt to analyze barriers or disciplines, intuitive impressions are given free rein, the generation of many ideas is encouraged, and evaluative criteria are used primarily to create a synthesis of material for new ideas (Dirkes, 1978).

Since learning and information acquisition seem to require more capabilities than strictly programmed instruction permit, the learning and decision-making state must furnish ample opportunities to explore and reinforce those ideas or relationships that lead to other testable patterns without being an end in themselves. A frontier is recognized herein as the imperative need to take fuller advantage of mental potential by searching out how the learning-receptive state is attained efficiently and what is the most productive way to use such passively focused awareness, it is granted that total reliance on the relaxed condition would invite diminishing returns if too much importance is accorded the instilling process without ever getting into applied execution of ideas or decisions.

Although the introduction of the Losanov (1975) educational methodology is reported to have successful results in Bulgaria and now through an Iowa State University adaptation (Prichard & Schuster, 1978), the attentiveness of the student/subject may fluctuate depending on the instructional mode and environmental controls. This evolving Suggestive-Accelerated Learning and Teaching (SALT) approach consists of inducing a relaxed and receptive cognitive state in the student by conscious suggestions and then presentation of the learning material in combination with background music (sound) frequencies. The pragmatic results of the Losanov method and the Americanized version are open to critical challenge in some respects. There is nevertheless a consistent record of repeated uses of the techniques under the method showing both a more attentive student adjustment and increased acquisition and retention in a shorter span of instruction. While a mix of audio-visual and even tactile stimuli are employed, the fundamental reference point is instructor voice or audio direction and evaluation.

Research in this area generally shows a deficiency primarily in terms of integration of component learning or training parts. Methodology advocated in this paper is to bring about the introduction of a consistent auditory signal stimulus with combined cognitive-emotional suggestions carrying tactical information and the use of performance-oriented bio-feedback. Because auditory guidance or signal frequencies are in part established as a known stimulus, it is further postulated that learning-receptive states of consciousness can yield positive learning effects as pulsed frequencies are experienced and instruction is phased into the monaural or binaural delivery and correlated biofeedback assists in clarifying performance objectives.

As exposure to a recently patented auditory guidance system (Monroe, 1977) has shown a potentially feasible approach in sound stimulus experimentation, effort has been invested in exploring the applied functions of such a system. Analysis of this Auditory Guidance System (AGS) paradigm should attempt to cover the "unified technology" of sound induction, content material design, and measure relationships to training effectiveness, modes of learning expression and perception, and states of conscious awareness. The major objective, then, is to try to investigate "what" improved learning and operational behavior could demonstrate more effective individual control and linkage of thought, informational, and memory processes.

RESULTS

Previous results from research in the area of anxiety and learning have consistently shown important relationships between various levels of anxiety and effectiveness of training (Isen, Clark, Shalker, & Karp, 1978). Most instructional technology largely ignores this set of relationships and must obtain further special elaboration to devise real applications to surmount unidentified frustration obstacles (UFOs) in trying to increase learning rate and mastery of complex behavior. Removal of cognitive-emotional barriers to effective learning is closely related to anxiety levels and has been substantially surveyed to identify targets for perceptive changes in gaining learning efficiency (McGrath & Cohen, 1978). Much of these research results have centered around building a learner's self confidence and receptivity by use of conscious and unconscious suggestion administered under specific levels of learner anxiety levels. Also, relatively sophisticated biofeedback instrumentation must provide verified relationships reinforcing the learner's capability to consciously control certain cognitive and emotional states favorable to learning receptiveness (Barber, 1972).

One attempt at a "unified technology" to change learning perceptions and responses, as illustrated by the SALT programs, strives to adapt knowledge from any pertinent field to accelerate the learning process by integrating cognitive-emotional stimuli into instructional programs. Conscious suggestions are given in the context of rhythmic performance with the background sound and altered modes of auditory expression and directed skill participation, reinforcing continually the feelings and attitude of relaxation and full satisfaction in performing the activity. Of many examples, both remedial work in language (Prichard & Taylor, 1976; Caskey, 1976) and teaching a junior high school science class (Gritton & Benitez-Bordon, 1976) have led to significant positive results in surmounting past barriers and acquiring new information.

A slightly similar development, which had its origin in the transcendental meditation (TM) movement and then broke away is that known under “the relaxation response” technique. Peters and Benson (1978) have reported highly positive results taking “the relaxation response” into a business setting from their Harvard research development site. They have provided consultative direction for voluntary “relaxation response breaks” resulting in significantly positive employee ratings of stress symptom reduction, improved performance and sociability-satisfaction.

Again, there is the recurring trend that physiological and psychological measures are strongly related and subject self control brings enhanced behavior and performance. Perhaps the remaining challenge is to discover how to precisely integrate the sound based instructions and rhythmic pulsing with properly reinforced learning modules and spaced training phases for performance skills.

In 1960 (Berlyne) a report of a Russian investigation described how pairing a tone signal with an electrical shock brought about a blood pressure or stress change. Gradually, though, with continuing trials of signal and shock in close sequence the response was extinguished, just as one usually adapts to a stimulus causing a mild irritant. However, with a change in stimulus pattern the tone by itself again evoked the stress arousal much as though one might respond to a cry in the night but only briefly attend when performing the multitude of concurrent day-time activities. Certainly learning and retention are affected by auditory stimuli to a recognizable degree. So, if the type of signal is available to induce and sustain a steady state of relaxed awareness with even possible peaked levels, and incisive, suggestively adapted course material is presented in well-focused, varied patterns, there should be a reasonable probability that both general and specific performance results are well within the scope of audio-guided behavior.

The AGS research being described by Monroe (1978) and demonstrated in stress-reduction workshops has identified a principal component in creating a newly innovated technique referred to as the frequency following response (FFR). There are cumulative experimental data showing how subjects respond to such sound frequencies structured to enhance the alpha brain waves and other psychophysical states. Such sound which moves through audible ranges also has masked pulses triggering what is termed the FFR. That is, there is synchronization of the signal and subject brain waves bringing a relaxed state, audible sound of surf and wind in the background, and the preparatory stage is set for altering alpha with programmed training modules and biofeedback monitoring. Drawing upon prior audiogenic discoveries and mnemonic instructional states, attention and learning dimensions can be charted based on the audio signals and combined voice instructions carried by mixed rhythms of monaural and binaural stimuli.

Following this line of exploratory development already verified in part by Monroe's generic patent of 1975, it is not inconceivable that research will quickly extend to take advantage of these partially confirmed audiogenic and adaptive listening pattern correlates. Adaptive learning behavior will build on a progressive series of FFR tape recordings letting the student experience differing information acquisition and perceptual dimension states. Using an adaptive mix of complex audio patterns, rather than static audio frequencies, carefully synchronized verbal guidance will instruct that selective listening techniques be passively focused on critical information processing requirements.

This approach could include a fully "unified training technology" of complementary suggestive learning and teaching precepts adhering to an engineered human resource model of training with sound, tailored course modules, and evaluative procedures. A parallel monitoring of electro-physiological activity would record further audiometric responses to indicate learning changes in attentiveness and perceptual modes. The extent to which audio stimulation and guided instructional content enhance operator capability would seem to deserve intensive research for probable high risk results to increase human potential in controlling complex mental activities.

DISCUSSION

Should the development of an AGS for accelerated learning techniques and instructional system design prevail in the face of those advocating only extrinsic motivation, it appears possible to markedly modify training patterns, perceptual modes and temporal states. By enhancing thought and information processing, memory and recall of data, human factor variables should function more reliably for intra- and inter-system operations. Learner and operator functions can have defined training requirements with selected critical tasks identified for sequential stages of assessed proficiency. Concurrently, experimental steps would analyze the patently valid basis of the AGS to evaluate any constraints in terms of information input functions and human storage security. By designing given training objectives, students following a programmed AGS sequence would furnish those data indicating the extent of AGS improved behavioral dimensions and operational performance.

Again, taking advantage of the proprietary AGS monaural and binaural stimuli, work should explore the relative scope of decision-making requirements involving novel human factor responses and functions of adaptive conscious states and associated physiological mechanisms.

Naturally, there are many questions needing answers in this developmental research area, substantiating even more the need for this comprehensive research strategy which may bear some similarity to the initial space research requiring interdisciplinary coordination. Now a realistic, well-integrated approach toward conquering facets of human, inner-space factors can produce new educational and behavioral practices for efficient learning and self control.

Rapid development of interactive computer systems and biofeedback instrumentation mark another convergence of scientific advances making the state of the art ready for audio and video response modes. Students could operate interactively in the future so that computer assisted instruction and self control of physiological parameters are synthesized. Assuredly, audio conditioning and guidance research achievements are moving into applied stages on a series of fronts running from sleep induction, stress and pain reduction, through suggestive-relaxed training.

The "unified training technology" to optimize intrinsic learning procedures and extrinsic motivational packages with computer assisted dialogues must not look that far away, unless one insists on denying the information and technological explosion. Many agencies, individuals, and systems are confronted with the challenge to deliver the intrinsic educational technology that will herald optimal student responses, while from another extrinsic direction we are exhorted to utilize more of our brain capacity. For example, in the wake of this turmoil, this past year a policy analyst (Fletcher, 1978) for the Deputy Assistant Secretary for Education noted that education would be completely revolutionized once a method could evolve to enable a person to have memory recall on demand or at least the processes for insuring retrieval.

What does this all have to do with personnel system testing and evaluation? You may rightly wonder! The AGS can yield in this "imagined" scenario within five to ten years that instructional technology assuring student attentiveness and rapid mastery of given subject-matter content. Verifiable responses would have the computer video support of adaptive, tailored testing breakthroughs (Urry, 1977) significantly testing with fewer questions and for greater psychometric efficiency. The highly structured student input will relate to the tailored testing and information theory and to a greater extent close the loop on diagnosing and prescribing accelerated or remedial learning conditions. Individuals should have more personal control for recall of their self contained micro-universe of test responses and respond more appropriately to the macro-content and selection search for precisely tailored test questions.

Over the 1990 horizon we may surely find an audio-video display terminal and AGS embedded training modules, the student interactively linked with the computer, and a wide assortment of tailored tests.

Certain audio and video stimuli patterns will guide relaxed but intensive self-retrieval searches. Alternating test trials should surmount emotional or skill barriers with precisely designed test responses. Between trial interpretive and transitional phases will suggest further guided instruction to store responses correlated with key evaluation criteria pinpointed by tailored testing dialogues.

In closing, might it now be agreed that acquisition and retrieval of information is aided with stress reduction as indicated by numerous verified measuring procedures? An affirmative answer would obviously suggest that instructional, information processing, and evaluative technology should now have the necessary design to include those auditory stimuli, which induce more affectively integrated and responsive behaviors.

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